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Working Party on Passive Safety (GRSP)
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FRONTAL COLLISION OF BUSES AND COACHES

Transmitted by the Expert from Spain

Note: The text reproduced below was prepared by the expert from Spain in accordance with the request of GRSP expressed at its thirty-fourth session .

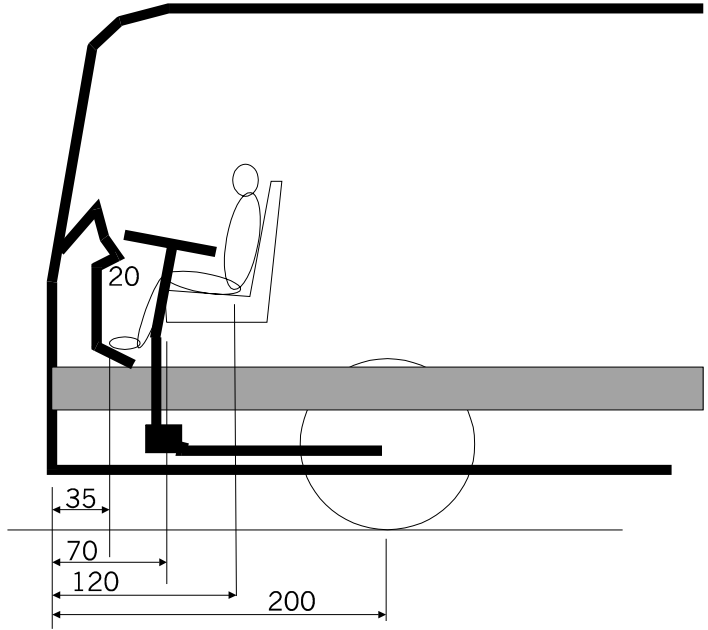
Note: *This text is distributed to the Experts on Passive Safety only.*

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In the annexed drawing, we can appreciate the main problem regarding the buses and coaches in case of frontal impact: there are only few centimetres between the front bumper and the drivers seat. There is not survival space

That means, each time the vehicle is deformed because an impact, the driver and or frontal passenger are necessarily touched.

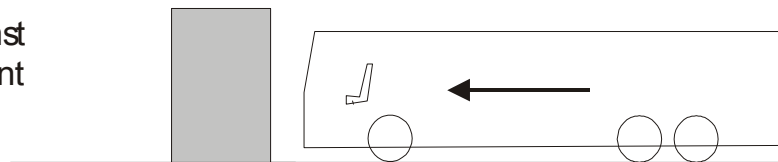
Also we can appreciate another problem for the driver: The steering wheel is nearly horizontal, and there is no enough space between their rim and the driver chest.



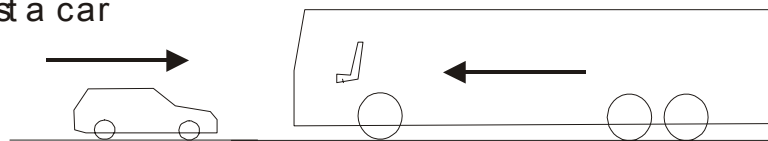
We presented below three typical busses impacts:

- a) **against a rigid obstacle:** Always driver and front passenger suffer injuries. Impact energy is completely dissipated on bus deformation, and there is not free space between bumper and driver
- b) **against a car running on opposite direction:** the car is completely destroyed, the bus is affected only in the lower front part (there is a risk for the bus driver); usually an impact as this one doesn't causes injuries to the passengers, but in Spain, some years ago we suffered an impact car to bus affecting one fuel tank located in front of the axle, and the fire appeared. Most of the passengers died because the fire
- c) **against a the rear part of a truck:** Usually the bus suffers more damages than the impacted truck; still once more, each bus deformation shall affect the driver

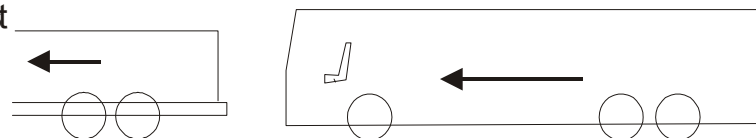
Impact against a rigid element



Impact against a car



Impact against the rear part of a truck

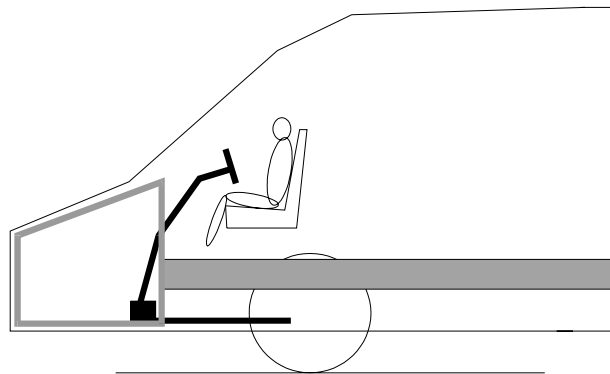


In our opinion, the best way for increasing the driver and passengers bus safety is increasing the distance between driver and front bumper, and using this new distance for the dissipation of impact energy.

That means, the vehicle will be longer than today if we keep unchanged the seating number.

The new volume situated in front of the driver, is designed only for energy dissipation, that means, vehicle deformation must be situated only in this frontal volume (for an impact against a rigid barrier at less than [X] km/h).

As a complement of the above described, the steering wheel should be located in a more vertical situation. That will increase the free distance between steering wheel and driver, and will permit the use of an airbag



There are two disadvantages in this approach:

The new vehicle is heavier, and in consequence fuel consumption shall increase, but also the vehicles front end design may be improved for a better aerodynamic, and that shall reduce fuel consumption at high speed; perhaps it should be necessary to increase the tyres load index, for permitting to keep unchanged the number of seats

The European directives specifies legal maximum dimensions, and in consequence, it shall be necessary to modify all concerned directives for acceptance of the new bigger length
